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(54) **Fuel tank filter**

Filter für Kraftstoffbehälter

Filtration pour réservoir de carburant

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(73) Proprietor: **FILTERTEK, INC.**
Hebron Illinois 60034 (US)

(72) Inventors:
- **Cain, Thomas A.**
Woodstock, Illinois 60098 (US)
- **Myers, Pim**
NL-5913 TP Venlo (NL)

(74) Representative: **Brose, D. Karl et al**
Patentanwälte Brose & Brose
Postfach 11 64
82301 Starnberg (DE)

(56) References cited:
US-A- 4 743 370
US-A- 4 874 510
US-A- 5 049 271

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to the invention are subject of the subclaims 2 to 13. The fuel tank filters of the present invention reliably accomodate the relative movement of the fuel tank bottom over prolonged periods of exposure to alcohol-blended gasolines, thereby assuring the presence of liquid fuel at the pump inlet.

The foregoing features and advantages of this invention will be further understood upon consideration of the following detailed description of embodiments of the invention taken in conjunction with the accompanying drawings, in which:

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a fuel filter of one embodiment of the present invention, partly broken away.

FIG. 2 is a cross-sectional view taken along line 2-2 of FIG. 1.

FIG. 3 is a partial top-plan view taken along line 3-3 of FIG. 2.

FIG. 4 is an exploded cross-sectional view of the connector of FIG. 3 taken along line 4-4 of FIG. 3.

FIG. 5 is a cross-sectional view taken along line 5-5 of FIG. 3.

FIG. 6 is a cross-sectional view taken along line 6-6 of FIG. 3.

FIG. 7 is a top plan view of the spring of FIGs. 1 and 2.

FIG. 8 is a side view of the spring of FIG. 7.

FIG. 9 is a cross-sectional view like FIG. 2 of another embodiment of the filter of the present invention.

FIG. 10 is a cross-sectional view of the connector of FIG. 9 taken along line 9-9 of FIG. 10.

DETAILED DESCRIPTION OF THE DRAWINGS AND PREFERRED EMBODIMENTS OF THE INVENTION

As shown in FIGS. 1 and 2, the filter 20 of the present invention is for use in a fuel tank 10. Also enclosed in the fuel tank 10 is a fuel pump inlet 16, and a fuel pump connected by wires, fuel lines, and bracketed to the top of tank 10 (all of which are conventional and none of which are shown). As discussed above, the present invention is designed for occasions where the bottom 14 of fuel tank 10, for one reason or another, moves up and down with respect to fuel pump inlet 16. As previously discussed, this commonly occurs when fuel tank 10 is comprised of plastic or some other material with a relatively high coefficient of expansion, and a pump is fixed to the top of fuel tank 10.

As shown in FIG. 1, filter 20 attaches to inlet 16 and includes a filtration material envelope 30, a generally double z-shaped spring 50, and a plastic connector element 70. The spring 50 separates the walls of envelope 30, and thereby holds envelope 30 open to improve fuel flow through the envelope 30, and biases the bottom of envelope 30 toward tank bottom 14. The envelope 30 is preferably composed of a nylon screen material 32. The screen material 32 is welded closed by latitudinal welds 34, 36 and longitudinal weld 38 to form the envelope shape.

Connector 70, as shown in FIGs. 3-6, is preferably of a two-piece construction, and is sealed to envelope 30 by the placement of filter screen 32 between top element 72 and bottom element 76 at top shoulder 74 and bottom shoulder 78. Integral with top shoulder 74 is reference flange 75 dimensioned to slide into a reference slot on a member (which is conventional and not shown) affixed either to the fuel pump or inlet 16 to secure filter 20 to inlet 16. Top shoulder 74 is also provided with reference slots 77, spaced 90° apart, for engagement with a pin or tongue (which is conventional and not shown) extending from the bottom of the fuel pump to further align filter 20. Also, a hole may be placed in flange 75 to allow a similar pin to be used to secure filter 20 to the pump by means of a conventional fastener, such as a lock washer and nut, located at the end of the pin. Integral with bottom shoulder 78 are diametrically opposed positioning plugs 80, each with retaining ridges 82 extending outwardly from the plug surface to define channels 84. Also integral with bottom shoulder 78 and dimensioned to tightly fit about the outer diameter of inlet 16 is fitting 73. Heat-staked to the end of fitting 73 is swell band 71, preferably of stainless steel, to assure a snug fit between inlet 16 and fitting 73.

A spring 50 is located within envelope 30, and is best seen in FIGs. 7 and 8. The spring 50 has a bilateral symmetric and is preferably in a double z-shaped configuration in the static state when viewed from a plane normal to the top and base legs. In the preferred embodiment, the spring is composed of a continuous piece of wire with top legs comprised of top runs 52 of a radius greater than the inner radius of fitting 72, positioning runs 54 of a radius to snap fit into channels 84, and clearance runs 56 extending beyond bottom shoulder 78; side legs comprised of outward runs 58, runs 60 parallel to the spring axis of symmetric and inward runs 62; and base legs comprised of inward runs 64 with hairpin curve 65.

Spring 50 is located on connector 70 by snap fitting the positioning runs 54 around the positioning plugs 80 in channels 84 and thus the top leg of spring 50 bears against bottom shoulder 78 of bottom element 76. Screen material 32 is preferably secured between shoulders 74, 78, and top and bottom elements 72, 76 are preferably secured together, by sonic welding. Screen material 32 is wrapped around the joints between the top and side legs of spring 50 and meets other screen material at welds 34, 36, and 38, all preferably sonically welded, to form envelope 30.

Located inside of envelope 30 is wear pad 90, which is affixed to filter material 32, preferably by sonic welding, at a point that prevents spring 50 from contacting filter material 32. In the preferred embodiment, wear pad 90 is located at about mid-length along inward runs 64

130) and to form a cavity for the filtered fuel, whereby the connector (70, 170) is connected to the inlet (16) of a fuel pump mounted inside the fuel tank (10), the spring member (50, 150) is a metal wire spring (50, 150) which is formed in a manner such that the lower part of said envelope (30, 130) is biased against the bottom (14, 114) of said fuel tank (10) to follow possible vertical movement of the bottom (14, 114), a wear pad (90, 190) is provided on the inside of said envelope (30, 130) slideably engaging the free end of said spring (50, 150) preventing contact between the spring (50, 150) and the filtration material (32), and said wear pad (90, 190) is affixed to the filtration material (32) to allow for relative movement between said free end of the spring (50, 150) and said wear pad (90, 190).

2. A fuel tank filter according to claim 1, characterized in that the connector (70, 170) is provided with positioning plugs (80, 180), and in that the spring (50, 150) is snap-fitted onto the positioning plugs (80, 180).

3. A fuel tank filter according to claim 1, characterized in that the filtration envelope (30, 130) is molded into the connector (70, 170), and in that a portion of the spring (50, 150) is embedded into the connector (70, 170).

4. A fuel tank filter according to any of the claims 1 to 3, characterized in that the spring (50) is consisting of stainless steel wire formed in a general double Z-shaped configuration with top legs (52, 54, 56), side legs (58, 60, 62) extending downwardly and outwardly therefrom and converging inwardly toward the bottom legs (64, 65), which converge inwardly and join at a curve (65) extending toward the inlet (16).

5. A fuel tank filter according to claim 4, characterized in that the top legs (52, 54, 56) are snap-fitted onto the positioning plugs (80) of the connector (70).

6. A fuel tank filter according to claim 4, characterized in that the top leg (52, 54, 56) of the Z-shaped spring (50) is embedded into the connector (70).

7. A fuel tank filter according to any of the preceding claims, characterized in that the wear pad (90) is crescent shaped.

8. A fuel tank filter according to any of the claims 1 to 3, characterized in that the spring (150) is consisting of stainless steel wire formed in a general conical helical configuration.

9. A fuel tank filter according to any of the preceding claims 1 to 6 or 8, characterized in that the wear pad (190) has a circular configuration, in that the wear pad (190) has a L-shaped cross-section, and in that the horizontal leg (194) of the L-shape is providing the bearing surface for the free end of the spring (50, 150).

10. A fuel tank filter according to claim 9, characterized in that the vertical leg (192) of the L-shape of the wear pad (190) is positioned inside of the spring (50, 150).

11. A fuel tank filter according to any of the preceding claims, characterized in that the connector (70, 170) is consisting of a top element (72) and a bottom element (76), and in that the filtration material (32) is sealed between adjacent shoulders (74, 78, 178) of the two elements (72, 76).

12. A fuel tank filter according to any of the preceding claims 2 ot 7 to 11, characterized in that the positioning plugs (80, 180) are integral with the connector (70, 170), in that the positioning plugs are provided with retaining ridges (82, 182), and in that the spring (50, 150) is snap-fitted onto the retaining ridges (82, 182) of the positioning plugs (80, 180).

13. A fuel tank filter according to any of the preceding claims 1 to 10 or 12, characterized in that the filtration envelope (30, 130) is molded into the connector (70, 170).

Patentansprüche

1. Filter (20,120) für Kraftstoffbehälter mit einem Anschluß (70, 170) der innerhalb eines Kraftstofftanks (10) an die Saugseite eines Kraftstofffördersystems angeschlossen ist, wobei der Filter (20, 120) aus einem Filtermaterial (32) besteht, welches eine Hülle (30, 130) bildet, und welches an dem Anschluß (70, 170) befestigt ist, sowie einem Federteil (50, 150), welches zwischen dem Anschluß (70, 170) und einem unteren Teil der Hülle (30, 130) wirksam ist, um eine merkliches Zusammenfallen der Hülle (30, 130) zu verhindern, und um einen Hohlraum für den gefilterten Kraftstoff zu bilden, wobei der Anschluß (70, 170) mit dem Einlaß (16) einer Kraftstoffpumpe die innerhalb des Kraftstofftanks (10) montiert ist, verbunden ist, der Federteil (50, 150) aus einer Metalldrahtfeder (50, 150) besteht, welche derart geformt ist, daß der untere Teil der Hülle (30, 130) gegen den Boden (14, 114) des Kraftstofftanks (10) gedrückt wird, um möglichen Vertikalbewegungen des Bodens (14, 114) zu folgen, wobei ferner ein Verschleißpolster (90, 190) auf der Innenseite der Hülle (30, 130) vorgesehen ist, welches gleitbar mit dem freien Ende der Feder (50, 150) in Eingriff steht und eine Berührung zwischen der Fe-

matériau filtrant (32) pour permettre un déplacement relatif entre ladite extrémité libre du ressort isù, 150) et ladite garniture de portée (90, 190).

2. Un filtre à réservoir à carburant selon la revendication 1, caractérisé en ce que le connecteur (70, 170) est pourvu de tétons de positionnement (80, 180) et en ce que le ressort (50, 150) est monté par encliquetage sur les tétons de positionnement (80, 180).

3. Un filtre pour réservoir à carburant selon la revendication 1, caractérisé en ce que l' enveloppe de filtration (30, 130) est moulée dans le connecteur (70, 170), et en ce qu'une partie du ressort (50, 150) est noyée dans le connecteur (70, 170).

4. Un filtre pour réservoir à carburant selon l'une quelconque des revendications 1 à 3, caractérisé en ce que le ressort (50) est constitué d'un fil en acier inoxydable, formé en une configuration globale en double Z, avec des pattes supérieures (52, 54, 56), des pattes latérales (58, 60, 62), s'étendant vers le bas et vers l'extérieur depuis celui-ci et convergeant vers l'intérieur en direction des pattes inférieures (64, 65), convergeant vers l'intérieur et se réunissant en donnant une courbe (65) s'étendant vers l'entrée (16).

5. Un filtre pour réservoir à carburant selon la revendication 4, caractérisé en ce que les pattes supérieures (52, 54, 56) sont montées par encliquetage sur les tétons de positionnement (80) connecteur (70).

6. Un filtre pour réservoir à carburant selon la revendication 4, caractérisé en ce que la patte supérieure (52, 54, 56) du ressort (50) en forme de Z est noyée dans le connecteur (70).

7. Un filtre pour réservoir à carburant selon l'une quelconque des revendications précédentes, caractérisé en ce que la garniture de portée (90) est en forme de croissant.

8. Un filtre pour réservoir à carburant selon l'une quelconque des revendications 1 à 3, caractérisé en ce que le ressort (150) est constitué d'un fil en acier inoxydable formé en une configuration hélicoïdale globalement conique.

9. Un filtre pour réservoir à carburant selon l'une quelconque des 1 à 6 ou 8 précédentes, caractérisé en ce que la garniture de portée (190) a une configuration circulaire, en ce que la garniture de portée (190) a une section transversale en forme de L, et en ce que la patte horizontale (194) de la forme en L constitue la surface de portée destinée à l'extrémité libre du ressort (50, 150).

10. Un filtre pour réservoir à carburant selon la revendication 4, caractérisé en ce que la patte verticale (192) de la forme en L de la garniture de portée (190) est positionnée à l'intérieur du ressort (50, 150).

11. Un filtre pour réservoir à carburant selon l'une quelconque des revendications précédentes, caractérisé en ce que le connecteur (70, 170) est constitué d'un élément supérieur (72) et d'un élément intérieur (76), et en ce que le matériau de filtration (32) est scellé entre des épaulements (74, 78, 178) adjacents des deux éléments (72, 76).

12. Un filtre pour réservoir à carburant selon l'une quelconque des revendications 2 ou 7 à 11 précédentes, caractérisé en ce que les tétons de positionnement (80, 180) sont réalisés d'une seule pièce avec le connecteur (70, 170), en ce que les tétons de positionnement sont pourvus de nervures de retenue (82, 182), et en ce que le ressort (50, 150) est monté par encliquetage sur les nervures de retenue (82, 182) des tétons de positionnement (80, 180).

13. Un filtre pour réservoir à carburant selon l'une quelconque des revendications 1 à 10 ou 12 précédentes, caractérisé en ce que l'enveloppe de filtration (30, 130) est moulée dans le connecteur (70, 170).

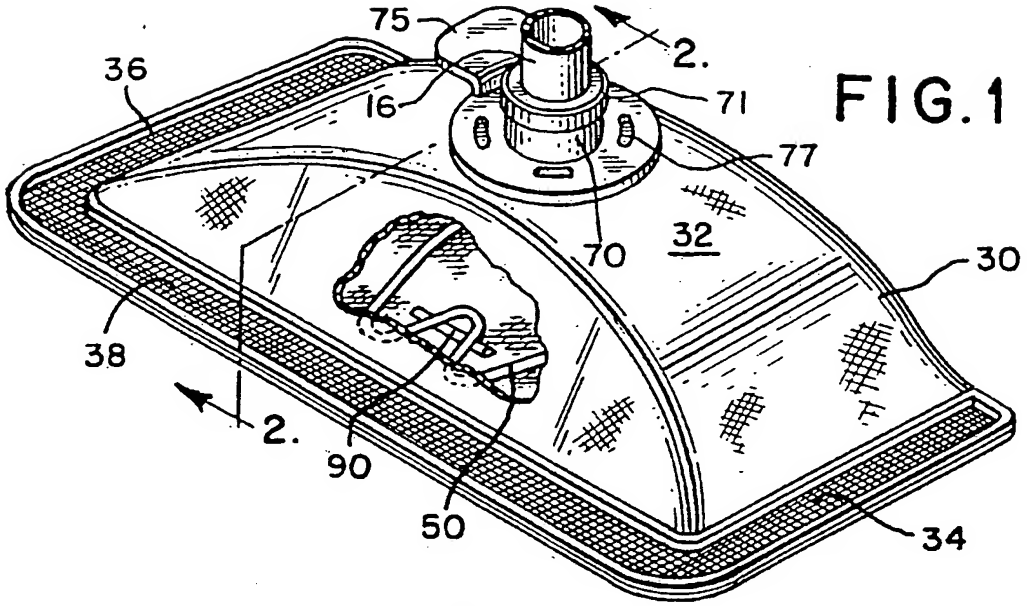


FIG. 1

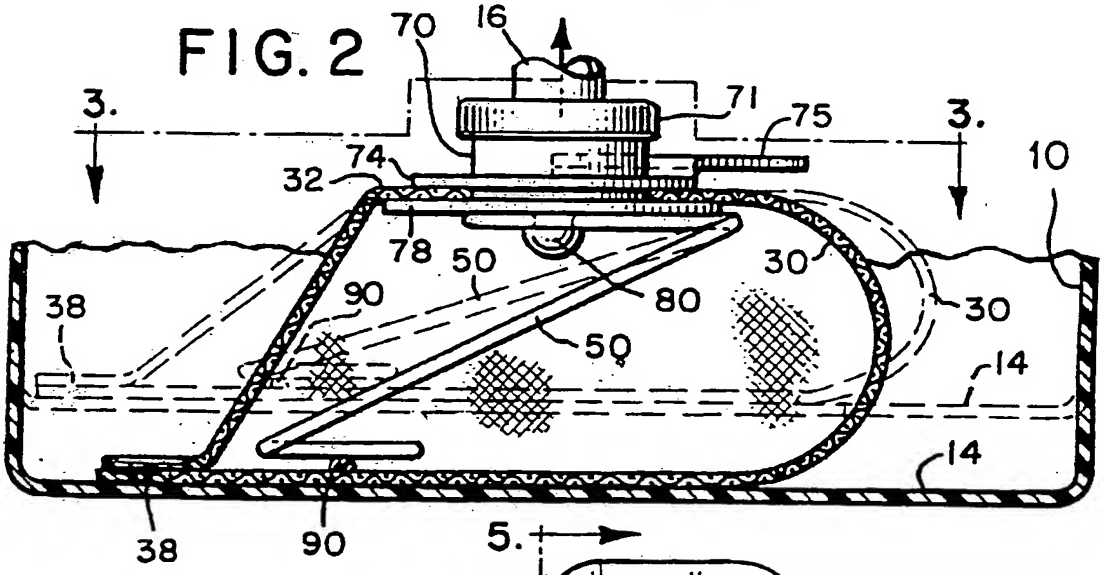


FIG. 2

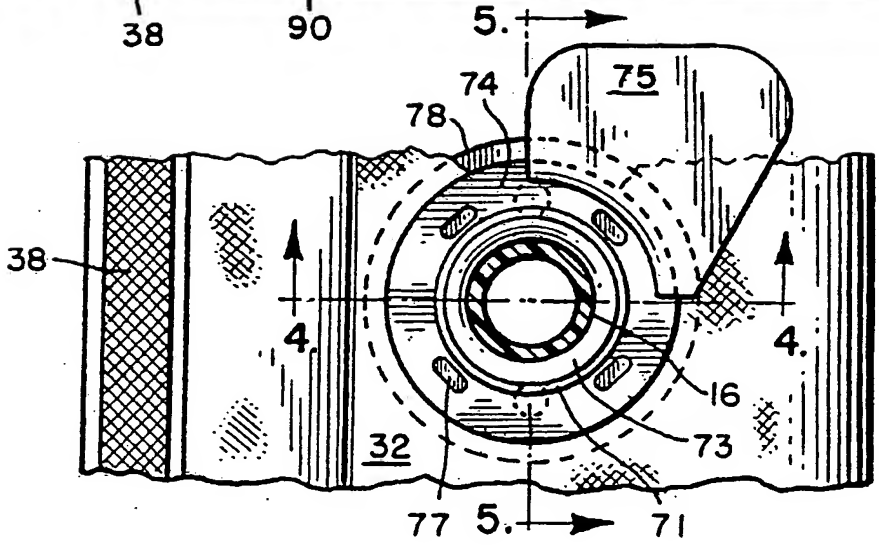


FIG. 3

FIG.4

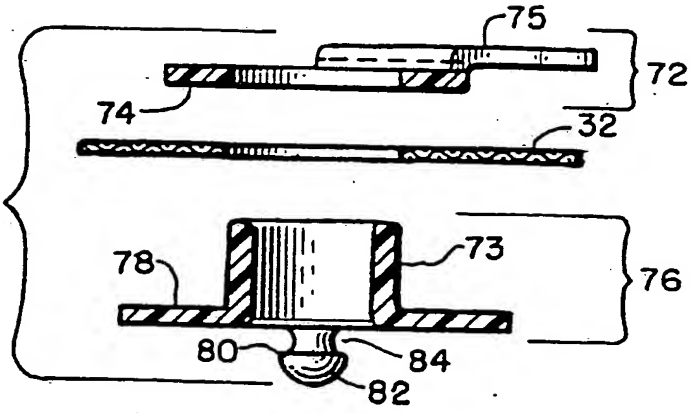
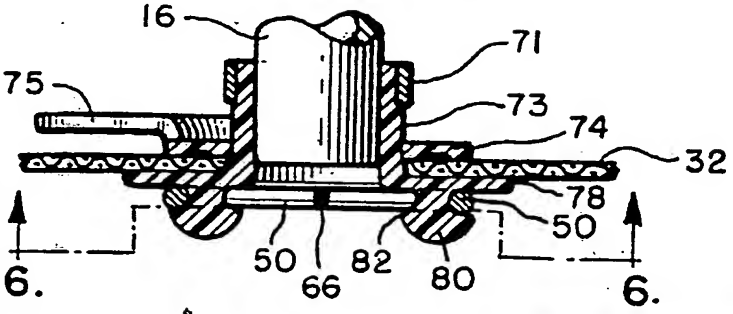


FIG.5



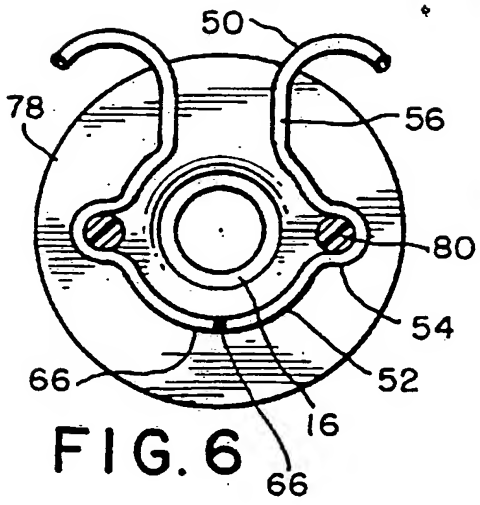


FIG.6

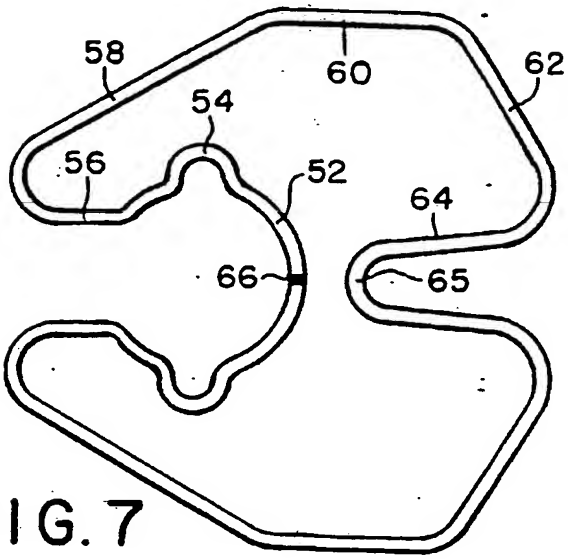


FIG.7

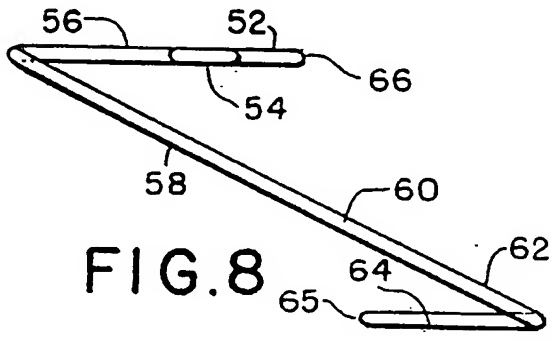


FIG.8

FIG. 9

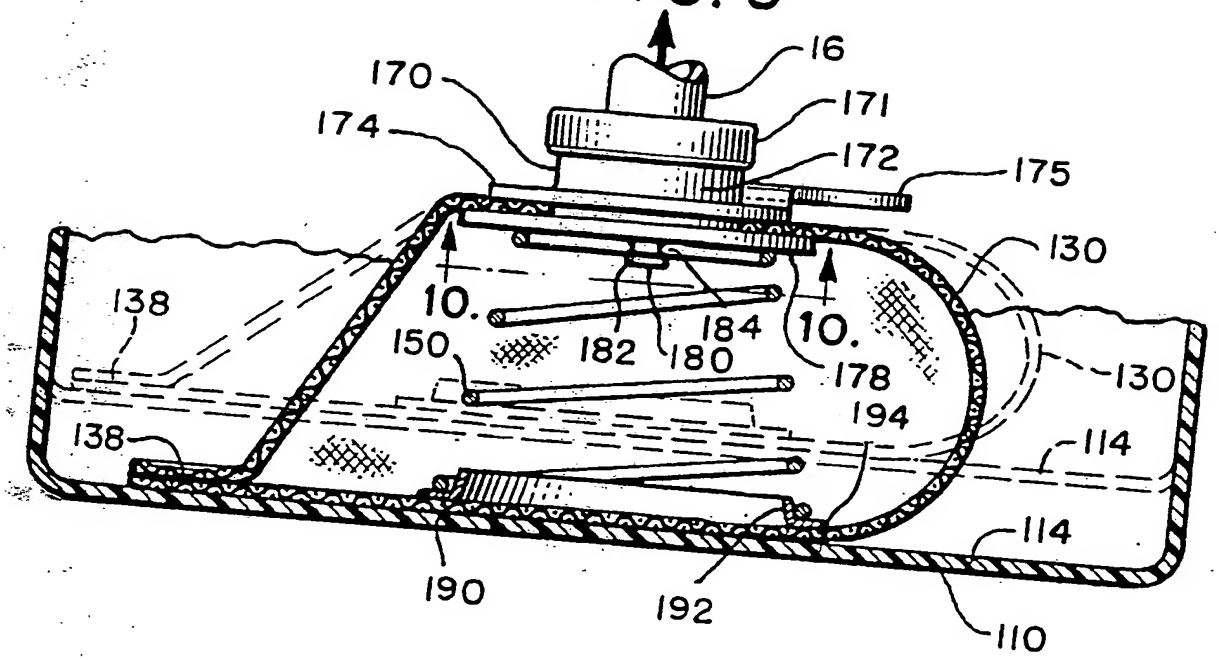
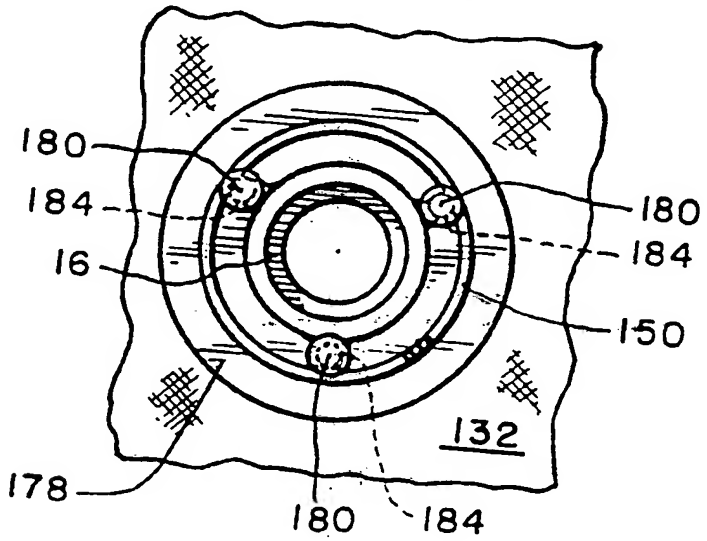

16
170
171
174
172
175
130
138
10.
10.
150
182
180
184
178
130
194
138
114
114
190
192
110

FIG. 10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184
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184
150
132
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